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FISH & RICHARDSON PC 225 FRANKLIN ST BOSTON, MA, 02110			GRAHAM, ANDREW R	
			ART UNIT	PAPER NUMBER
			2644	

DATE MAILED: 12/19/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/735,123

Applicant(s)

AYLWARD ET AL.

Examiner

Andrew Graham

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12/12/00
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 July 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

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DETAILED ACTION

Drawings

1. The drawings were received on July 11, 2001. These drawings are have been entered into the application.

The drawings are objected to because Figure 5b does not include label for the vertical or horizontal axis of the graph. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

2. The disclosure is objected to because of the following informality:

The application number on page 3, line 22 is blank.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. **Claims 1-10 and 18-20** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out

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and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 includes the limitation "a first frequency range" in both lines 3 and 7 of the claim. The claim is rejected because such references leave unclear whether or not these frequency ranges are intended to be understood as the same frequency range. This reference to two "first frequency ranges" also renders indefinite any other reference to "said first frequency range", such as that in **Claims 2 and 10**. Appropriate clarification is required.

Claims 3 and 9 are rejected for containing period marks (.) in the first line of each of the respective claims.

Claims 18 and 19 include the limitations "frequency spacing of approximately 16" and "spacing factor... between three and five", respectively. In the context given, the concept of "frequency spacing" between all-pass filters does not clearly explain what is intended to be understood from said phrasing. Further detail in the claims regarding such limitations, including but not limited to some form of units, is required.

Claims 18 and 19 also include the limitation "fourth all pass filter coupling said first all pass filter and said combiner". However, Figure 6, to which the claims appear to correspond, appear to include two sets of all pass filter in series, not a parallel set of filters in series with a single filter. Accordingly, it appears that the above cited phrasing should read "fourth all pass filter coupling said *second* all pass filter and said combiner"

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Claim 20 includes the limitation "for filtering said first low-ass filter for filtering". This phrase, while including a typographical error, also appears to be missing words or possibly includes too many words. Appropriate correction is required.

Claims 4-8 are rejected due to their respective dependencies upon rejected claims.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. **Claims 1-6, 11-14, and 22-23** are rejected under 35 U.S.C. 102(b) as being anticipated by Robinson (USPN 4356349).

Robinson discloses a method and apparatus for enhancing a stereo signal. Such a system, as illustrated in Figure 1A, involves the modification of two different input signals on two input lines (20,24) (col. 4, lines 1-4). These two signals, derived initially from stereo audio signals, read on "a first audio signal from a first audio channel and a second audio signal from a second audio channel" (col. 3, lines 58-61). The modifier network (30) for one of the signals introduces a small time delay to the low frequency component of the signal, which in terms of sinusoidal signals is equivalent to a time

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delay (col. 4, lines 11-17). This modification of the particular frequency range of one of the signals reads on "shifting the phase of said of said first audio signal relative to said second audio signal, wherein said shifting is substantially limited to a first frequency range". After modification, the two signals are combined with a summing network (34), which reads on "combining the audio signal from said first channel with the audio signal from the second channel".

Regarding **Claim 2**, the time delay is applied to the low frequency range of the processed signal, which reads on "said first frequency range is the bass frequency range".

Regarding **Claim 3**, the input to each of the modifying circuits is derived from the combination of stereo input signals. The upper input signal line (20) shown in Figure 1A receives a summation of two copies of the input stereo signal from a summing network (18) (col. 4, lines 1-4). The forming of this signal on the connection wire (20) reads on "downmixing a third channel and a fourth channel to produce a one of said first channel or said second channel".

Regarding **Claim 4**, similar to the means discussed in regards to Claim 5, the signal provided on connection line (24) is formed through the subtraction of two copies of an input stereo signal with a difference network (22) (col. 4, lines 1-4). The forming of this signal, based on a copy of the stereo input signal reads on "the step of downmixing a fifth channel and a sixth channel to produce the other of said first channel or said second channel".

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Regarding **Claim 5**, please refer to the like teachings of Claim 3.

Regarding **Claim 6**, please refer to the like teachings of Claim 4.

Regarding **Claim 11**, please refer to the like teachings of Claim 1.

Regarding **Claim 12**, please refer to the like teachings of Claim 2, noting that the time delay is applied to the low frequency portion of the signal, and not the other frequency ranges, which reads on "to maintain the phase of said first channel signal relative to said second channel signal unchanged over a second range". Regarding **Claim 13**, please refer to the like teachings of Claim 2, again noting that the time delay is applied to the low frequency part of the signal.

Regarding **Claim 14**, please refer to the like teachings of Claim 1.

Regarding **Claim 22**, please refer to the like teachings of Claim 3.

Regarding **Claim 23**, please refer to the like teachings of Claim 1.

5. **Claims 24-26** are rejected under 35 U.S.C. 102(b) as being anticipated by Fellgett (USPN 4251685).

Fellgett discloses a method for transmitting and reconstructing the input signals from a plurality of variously positioned microphones. The embodiment shown in Figure 3 involves the relative phase shifting of each of the input signals from the microphone 30,31,32,33) before they are combined into what is referred to as an azimuth channel (A) (col. 5, lines 11-18). The combination of the four signals representing four different input locations reads on "A method for combining n audio signals from n audio signal channels, where n is a number greater than 2". The phase shift applied by phase

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shift circuits (35,36,37) reads on "relatively shifting the phase of each of said audio signals relative to each of the other audio signals to furnish corresponding phase-shifted signals". The summation of the signals into a signal channel signal (A) reads on "combining the n phase-shifted audio signals".

Regarding **Claim 25**, the phase shift amounts applied to the four input signals are 0° , 90° , 180° , and 270° , which reads on "said relative shifting comprises shifting the phase of each of said audio signals by a different amount" (col. 5, lines 13-17).

Regarding **Claim 26**, the phase shift amounts applied to the four input signals are 0° , 90° , 180° , and 270° (col. 5, lines 13-17). These phase shifts meet the requirements set by the limitation, "wherein said relative shifting comprises shifting the phase of each of said audio signals by $i360/n$ degrees, where I is an integer index from the group consisting of zero to n-1 and one to n".

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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6. **Claims 7 and 15-17** are rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson as applied above, and in further view of Griesinger (WO 99/33173). As detailed above, Robinson discloses circuitry for improving the low frequency output of a stereo speaker system, in which the improvement involves the phase shifting of one processed signal in regards to another. The phase shift is applied in the system of Robinson with a time delay (col. 4, lines 13-17).

Robinson does not specify:

- that each of the signal relative shifting involves an all pass filter and filtering the respective first and second audio signals from the respective audio channels
- that the parameters of the all pass filters are selected such that the shifting occurs only over the specified frequency range

Griesinger discloses the concept of driving two separate speakers with two different signals, wherein the different driving signals involve low frequency portions that are particularly out of phase with each other. The phase difference between the two signals is incorporated through the use of all pass filters that apply a phase shift to the low frequencies, but leave the high frequencies unaffected (page 21, lines 25-30). The shifting occurs for both of the involved signal processing paths, and the resulting phase difference between the two signals is 90 degrees (page 21, lines 30-31 and page 22, line 1). The shifting performed by the filter and the actual application of the filter reads on "shifting involves applying

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said first audio signal to a circuit including a first all-pass filter" and "filtering said audio signal from said first audio channel" as well as the similar application and processing limitations for the second signal. The shifting of the signal in only the low frequency ranges by the filters reads on "wherein parameters of said first all-pass filter and parameters of said second all-pass filter are selected so that said relative shifting occurs only over said first frequency range".

To one of ordinary skill in the art at the time the invention was made, it would have been obvious to include the signal shifting means of Griesinger into the processing system of Robinson. The motivation behind such a modification would have been that Robison gives the circuit level details regarding the implementation of the components, which would have enabled modifications to the shifting circuitry to be easily made. The scheme of Griesinger also involves phase shifting of both involved signals, redundancy that would have benefited the dual processing means of the system of Robinson.

Regarding **Claim 15**, please refer to the like teachings of Claim 7. Regarding **Claim 16**, please refer to the like teachings of Claim 7. Regarding **Claim 17**, please refer to the like teachings of Claim 2.

7. **Claims 8 and 9** are rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson as applied above, and in further view of Cooper et al (USPN 4910779).

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As detailed above, Robinson discloses circuitry for improving the low frequency output of a stereo speaker system, in which the improvement involves the phase shifting of one processed signal in regards to another.

Robinson does not specify:

- adjusting the frequency response of the combined audio signals

Cooper discloses a system for the enhancement of a stereo signal involving crosstalk cancellation and head related transfer function equalization. The embodiment shown in Figure 1D includes distinct equalizing circuits (157,159) for each of the audio signal lines (col. 7, lines 67-68 and col. 8, lines 1-4). Cooper also discloses that the equalizing filters may be included at the output of the processing circuitry shown therein, after the processed signals have been recombined (col. 8, lines 24-26). This reads on "adjusting the frequency response of the path carrying the combined audio signal".

To one of ordinary skill in the art at the time the invention was made, it would have been obvious to include the equalization circuits at the output of the signal processing means of Robinson as taught by Cooper. The motivation behind such a modification would have been that the improvement imparted on the output signals in regards to a head related transfer function and the general equalization of the signals.

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Regarding **Claim 9**, the frequency adjusting means (157,159) are equalizers, which reads on "said adjusting include equalizing said combined audio signal".

8. **Claims 10, 20, and 21** are rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson, as applied above, and in further view of Kuusama et al (USPN 6332026). Hereafter, "Kuusama et al" will simply be referred to as "Kuusama".

As detailed above, Robinson discloses circuitry for improving the low frequency output of a stereo speaker system, in which the improvement involves the phase shifting of one processed signal in regards to another.

Robinson does not specify:

- that the combining only involves the combination of spectral components in the first frequency range

Kuusama discloses a system for deriving a low frequency effect audio signal. Such a system involves the low pass filtering of a combination of the surround input signals, and combining the filtered signal with a subwoofer signal, and then providing the modified signal as output or for use in combination with other channel signals (col. 4, lines 64-67 and col. 5, lines 1-16). The combination of the low pass filtered signal and the subwoofer signal reads on "said combining combines only the spectral components in said first frequency range".

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To one of ordinary skill in the art at the time the invention was made, it would have been obvious to include the low frequency signal enhancement system of Robinson into the low frequency channel forming arrangement of Kuusama. The motivation behind such a modification would have been that such signal enhancement of Robinson would have been able to improve the low frequencies of the produced signal of Kuusama directly. Robinson discloses the improvement of low frequency ranges between channels of signals, and Kuusama discloses the combination of several channel signals to form a low frequency signal.

Regarding **Claim 20**, the two signals combined in the system of Kuusama include only low frequency components. While the subwoofer signal is not explicitly filtered, the nature of the invention would have made obvious the inclusion of a low pass filter for altering the signal as such in order to provide the output signal in the desirable frequency range. The concepts of Kuusama, in view of the teachings of Robinson, read on "a first low pass filter for filtering said first audio signal" and a second low pass filter "for filtering said second audio signal so that said combiner combines only the bass portions of said first audio signal and said second audio signal".

Regarding **Claim 21**, the combined signal in the system of Kuusama is again low pass filtered (9), which reads on "a low pass filter for filtering the output signal of said combiner to provide only the bass portion of said combined signal" (col. 5, lines 5-8).

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9. **Claims 18 and 19** are rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson as applied above, and in further view of Gerzon (USPN 5671287) and Peters (USPN 4063034).

As detailed above, Robinson discloses circuitry for improving the low frequency output of a stereo speaker system, in which the improvement involves the phase shifting of one processed signal in regards to another. Griesinger discloses the use of an all pass filter for imparting the phase shifting of the signals.

However, Robinson in view of Griesinger does not specify:

- the use of two all pass filters in series in each of the signal processing paths

Gerzon discloses systems with various all pass network configurations for variously processing a stereo signal. One embodiment, shown in Figure 10, involves the use of sequentially applied all pass filters (1L,5aL). As the output of the second sequential all pass filter is applied to a combining circuit, this arrangement reads on "a third all pass filter coupling said first all-pass filter and said combiner" and third all-pass filter having third all-pass filter parameters". The similar processing for the other signal path reads on "a fourth all-pass filter coupling said first all-pass filter and said combiner" and "fourth all-pass filter having fourth filter parameters".

To one of ordinary skill in the art at the time the invention was made, it would have been obvious to include the sequential all pass filters of the system of Gerzon into the processing scheme of

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Robinson in view of Griesinger. The motivation behind such a modification would have been that would have been that the additional all-pass filters would have enabled additional processing effects and functions to be imparted upon the audio signal before they are combined to produce the final output signals for the system.

However, Robinson in view of Griesinger and Gerzon does not specify:

- that the frequency spacing between the combination of filter is 16

Peters discloses an audio system with an enhanced spatial effect. Such a system involves a filter (36) with plurality of taps (41,42) that determine the frequency spacing of the application of the filter (col. 7, lines 22-40). Peters discloses that spacing of these delaying directly affects the output quality of the processed signal, and that a smaller frequency spacing is preferred (col. 7, lines 32-40). A smaller relative frequency spacing, in view of the art, provides the obvious improvement of higher processing resolution for the involved frequencies. The relative natures of the teachings of Peters and the system of Robinson in view of Griesinger and Gerzon enable these teachings to read on "wherein the first and third all-pass filters have a frequency spacing of approximately 16 and wherein said second and fourth all pass filters have a spacing of approximately 16".

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To one of ordinary skill in the art at the time the invention was made, it would have been obvious to include the preference of a relative small frequency spacing as disclosed for the system of Peters into the enhancement arrangement of Robinson in view of Griesinger and Gerzon. The motivation behind such a modification would have been the higher frequency resolution and improved processing for smaller frequency segments of the audio signal.

Regarding **Claim 19**, please refer to the like teachings of Claim 18, noting again that Peters discloses a preference for small frequency spacing between delay elements.

10. **Claims 24, 27, and 28** are rejected under 35 U.S.C. 103 (a) as being anticipated by Robinson, as applied above, and in further view of Klayman (USPN 5970152).

As detailed above, Robinson discloses a method for enhancing a multi-channel audio signal by introducing a time delay into the low frequency portion of involved audio signals. The processed signals, as discussed in further details in regards to Claim 1, are combined to form final output signals, which reads on "combining the n phase shifted audio signals". The embodiments disclosed by Robinson involve stereo signals.

Robinson does not specify:

- the combining of n audio signals from n audio signal channels, where n is a number greater than two

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- relative phase shifting each of the audio signals relative to each other

Klayman discloses a system for enhancing a surround sound system number of channels. Such a system involves a plurality of enhancement means that receive input signals and output enhanced versions of the signals to be combined to form speaker output signals (col. 3, lines 3-9). Klayman specifically states that the enhancement methods may include phase shifting (col. 7 lines 8-14). In view of the teachings of Robinson, this reads on "relatively shifting the phase of each of said audio signals relative to each of the other audio signals to furnish corresponding phase-shifted signals". Summing junctions form the final output signals from these enhancement devices, which reads on "combining the n phase shifted audio signals".

To one of ordinary skill in the art at the time the invention was made, it would have been obvious to implement the phase shifting method of Robinson into the multi-channel enhancement system of Klayman. The motivation behind such a modification would have been the improvement of the low frequency signal reproduction, as taught by Robinson, for a greater number of channels beyond those of a stereo system, the arrangements for which are disclosed by Klayman.

Regarding **Claim 27**, please refer to the like teachings of Claim 1. Regarding **Claim 28**, please refer to the like teachings of Claim 2.

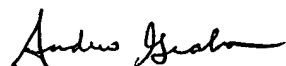
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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew Graham whose telephone number is (703) 308-6729. The examiner can normally be reached on Monday-Friday (7:30-4:30), excluding alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Isen, can be reached at (703) 305-4386. The fax number for the organization where this application or proceeding is assigned is 703-872-9314 for regular communications, and 703-872-9315 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.



Andrew Graham
Examiner
A.U. 2644

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December 15, 2003

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XU MEI
PRIMARY EXAMINER